Ali Sarmad Khan – 4415582 – Sustainable Design Graduation Studio - Reflection – 13/05/16

The primary motivators for my research were easy access to fabrication technology and my interest in conservation inspired by the imminent threats faced by built heritage in my home country Pakistan due to unrestricted infrastructure projects. My research consists of an amalgamation of multiple fields, architectural conservation, digital fabrication and 3D scanning, each with varying modes of research. An aspect of the project also deals with redefining the role of the craftsman as a 'neo-craftsperson' in the digital age. The goal of the project was to discover the possibilities of 'patching' damaged ornaments from built heritage with the aid of laser scanning and digital fabrication techniques.

Initially I had two test cases, a Belgian blue limestone column section (stored in the faculty) and a damaged wooden angel relief on Hammenpoort, a gateway to Hammenwoning, a Boerderij (Farmyard) on Rotterdamsweg in Delft. I soon realized (after the P3) that the scope of the project had to be narrowed due to the problems faced during the restoration process and the need to acquire new software skills from scratch. Therefore, the column section was chosen as the primary test candidate, with most of the focus directed towards it.

Owing to my decision to choose test candidates for experimentation, the project moved from theory to application. This change introduces many more variables and the project becomes more logistically complex with the results of the project depending on more than one individual. An example of such logistical problems occurred during the laser scanning of the Boerderij. During an inspection of the site a few days before the planned scanning, it was determined that the tripod in use by the scanning company Delfttech required a boost of 2 meters to reach the scan target for optimum scanning quality.

Multiple options were considered: acquiring scaffolding, finding a different tripod or using the hydraulic lift on the back of the LightVan (a mobile laboratory available to the Building Technology faculty). The back of the LightVan wasn't high enough, a tripod was found in the BT faculty but the screw had a different thread radius than the one required for the tribrach of the laser scanner and the FMVG (Facility Management & Real Estate) department of TU Delft always outsourced all of their scaffolding requirements. It was then decided to rent a small 'Kamersteiger' (a mobile interior scaffold) from Boels in Delft. The scaffolding (with a working height of 3m) was then transported using the LightVan to the site where the laser scanning apparatus was set up. These issues added a delay of 3 days to the predetermined scanning date but the required results were eventually received.

The second test case, the stone column fragment was also an interesting study since it was discovered during the meshing process that the fragment was not entire symmetrical, which was not surprising since

it was hand-crafted. Further delays were caused by issues with the SLA 3D printer due to which the secondary option of using an FDM 3D printer was adopted. Issues with the milling machine for milling the wooden mold reinforcement also caused delays.

In my experience, hands-on experimentation can lead to knowledge that cannot be acquired from just literature view, it helps you create contingency plans and gives you a better understanding of the process. Literature review is equally important since it sets the basis for the experimentation; the two are therefore co-dependent.

Aspect 1: Relationship between research and design

Although the project doesn't have a 'design' in the traditional sense, it does have end products: the manufactured fragments that are complementary to the damaged geometry. Most of the research however consists of research on the scanning and fabrication technologies to be used as well as the more theoretical aspect of the role of craftsmen in the digital age. The research directly affects the design during the 'interpolation' (or digital repair) of the geometry when certain aspects of the history and material of the chosen element have to be taken into consideration. Another aspect that comes into play at his stage is experience with the mesh modeling software package(s), some of which comes by default by virtue of previous architectural education. Other more specialized packages have a similar learning curve but any gaps in information can be filled by relevant manuals and tutorials, or even just via trial and error.

Aspect 2: The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object).

Although directly not related to any of the graduation labs, this project still has some aspects that apply to multiple graduation labs. It has elements of restoration (some of which are covered in the glass restoration topics), facades (since this technique can also be used in the restoration of ornamental facades) and digital fabrication (some of the façade topics incorporate digital fabrication techniques like additive manufacturing). This being a Building Technology project, there will be more focus on the technical aspects of the process like the design of the scanning and manufacturing workflow and any the documentation of any problems experienced during these workflows. There will however also be some focus on the materiality of the materials used and attention will be paid to the historical sensitivity of the chosen test candidates.

Aspect 3: The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework.

While the project will also document and include workflows for multiple restoration candidates, only one of those candidates (initially two) were chosen for testing: the column fragment found in the BK City basement. The results of these tests will be the final products of the project, making it more of a research by experimentation project. The general methodology in the Façade Design lab for example starts with a literature review, after which experimentation may be performed if required, and the final product is a design that corresponds to the theme of the lab. This project works along similar lines with the end product not being a design but the process / workflow.

Aspect 4: The relationship between the project and the wider social context.

This aspect I believe has a strong association with this project since it deals with the role of craftsmanship in the digital age. The role of craftsmanship has historically been re-evaluated after every epoch of industrial progress (namely the two industrial revolutions). The third industrial revolution (also called the digital revolution) demands the same re-evaluation regarding the role of the craftsman. It can be argued that a person who digitally manipulates a mesh by interfacing with a computer via a mouse or any other input device for the purposes of manufacturing, satisfies the same aspects that define a craftsman. He or she uses the computer (the tool) to improve upon their craft, just like a potter uses a potter's wheel. Additionally, there is also an imminent threat to global built heritage due to war and terrorism, especially in inaccessible regions like the Levant. An example being the destruction of Palmyra in Syria. If these techniques and work-flows are developed the rebuilding and restoration processes can receive a boost.